SH-2 SERVICE NOTES

● SPECIFICATIONS

•KEYBOARD
37 keys, 3 octaves

•VCO
AUTO BEND
MOD (modulation depth)
PULSE WIDTH (50% — MIN)
PWM MODE SWITCH (ENV/MAN/LFO)
TOTAL TUNE
VCO-1
RANGE (32', 16', 8', 4', 2')
WAVEFORM (∿ , ◿ , ⊓ , ⊓⌋)
BENDER ON/OFF SWITCH
VCO-2
RANGE (32', 16', 8', 4', 2')
WAVEFORM (NOISE, ◿ , ⊓⌋ , ⌜⊓⌋)
VCO-2 TUNE
TUNE RANGE (WIDE/NARROW)

•AUDIO MIXER
VCO-1 SUB
VCO-1
VCO-2

•VCF
CUTOFF FREQUENCY (10Hz - 20kHz)
RESONANCE (0 - self oscillation)
ENVELOPE SWITCH (ENV FOL'R, ENV ⌒ , ENV ⌣)
ENVELOPE CONTROL
MODULATION CONTROL
KYBD CV CONTROL

•VCA
MODULATION SWITCH (HOLD, ENV ⌒)
KYBD GATE ⎍)

•ENVELOPE GENERATOR
ATTACK TIME (1ms - 2.5s)
DECAY TIME (2ms - 10s)
SUSTAIN LEVEL (0 - 100%)
RELEASE TIME (2ms - 10s)
GATE SELECTOR SWITCH
(GATE-TRIG/GATE/LFO)

•MODULATOR (LFO)
MODE (RANDOM/ ⊓ / ∿)
RATE (0.2Hz - 25Hz)
DELAY TIME (0 - 1.5s)
LED INDICATOR

•POWER SWITCH (with LED indicator)
•VOLUME CONTROL
•PORTAMENTO (0 - 5s)
•BENDER LEVER

•INPUTS/OUTPUTS
OUTPUT jack (-10dBm)
HEADPHONE jack (stereo, 8Ω)
CV INPUT jack (1V/oct)
GATE INPUT JACK (+7.5V min)
CV OUTPUT jack (1V/oct)
GATE OUTPUT jack (OFF = 0V;ON = 14V)
EXT AUDIO IN jack (0.5V p-p, max)

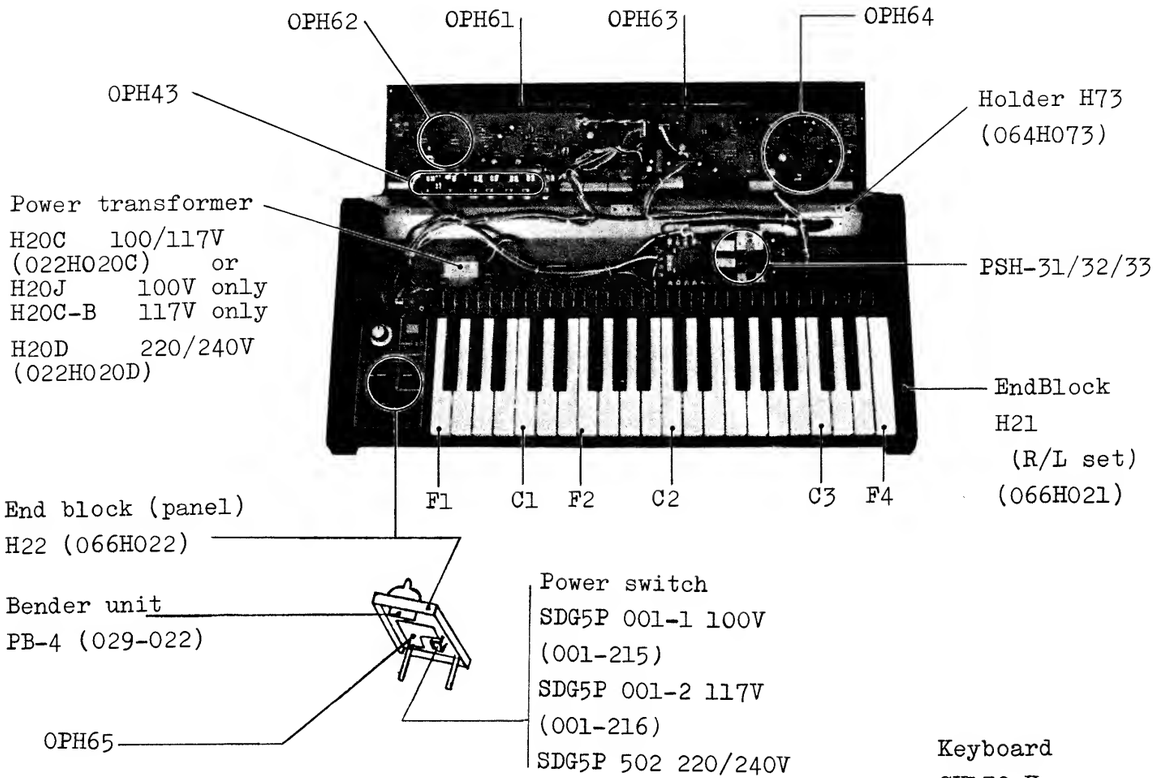
•POWER CONSUMPTION: 11W

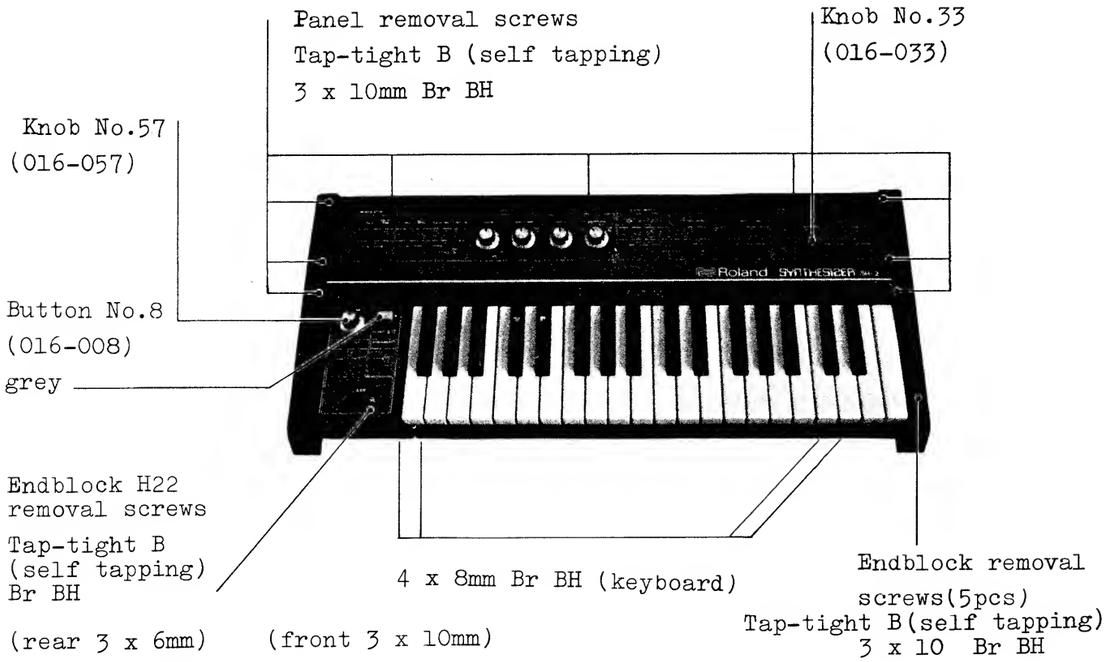
•DIMENSIONS:670(w)x305(d)x100(h)mm

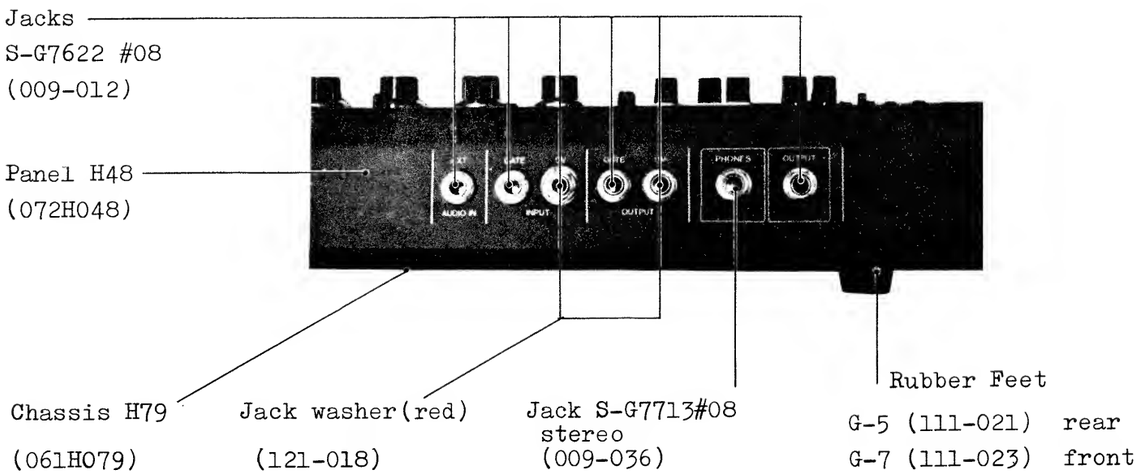
•WEIGHT: 6.9kg

•ACCESSORIES : 2.5m patch cord

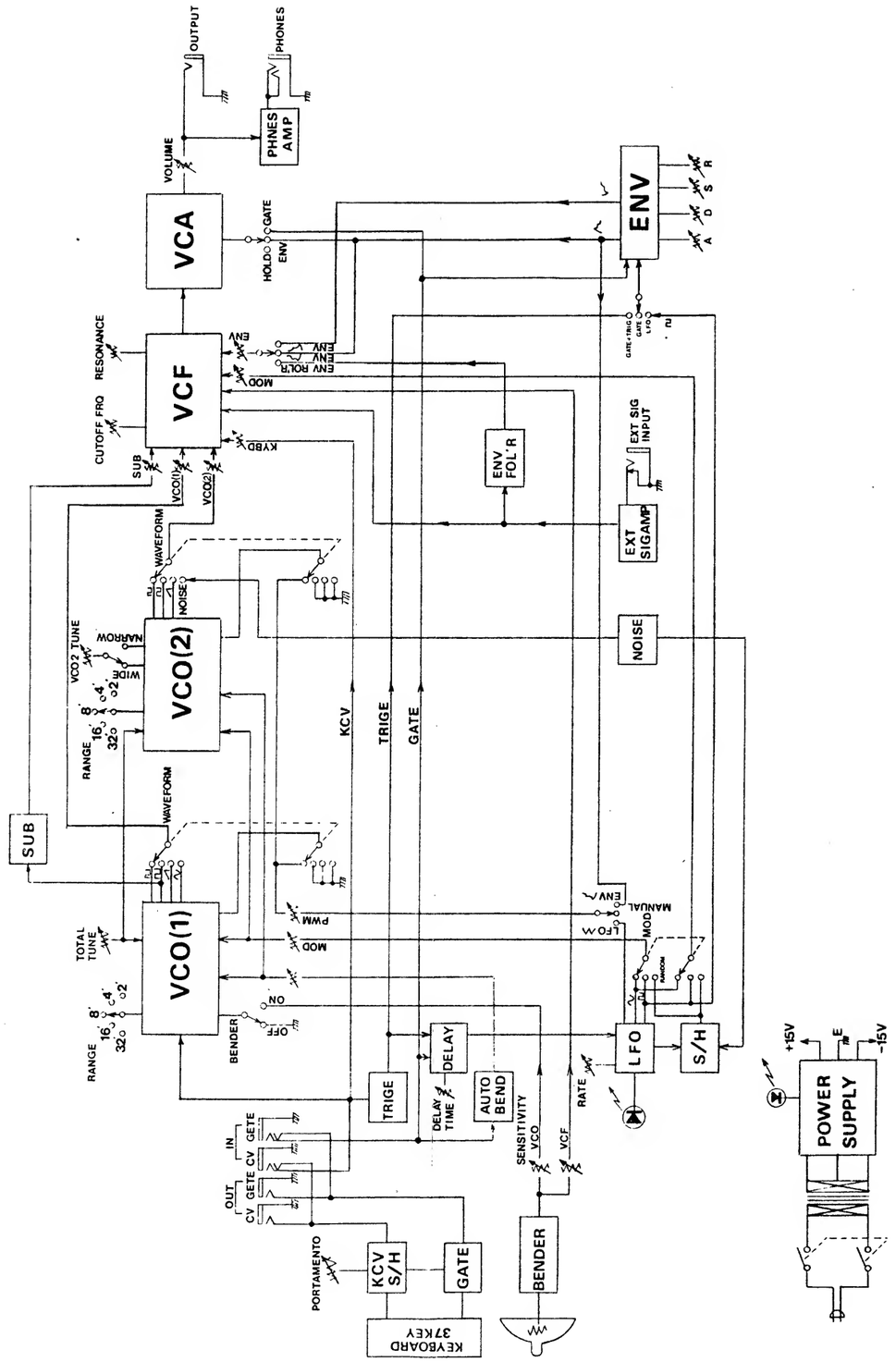
When ordering PCBs, suffix letter to PCB name referring to the Parts List and PCB layout.



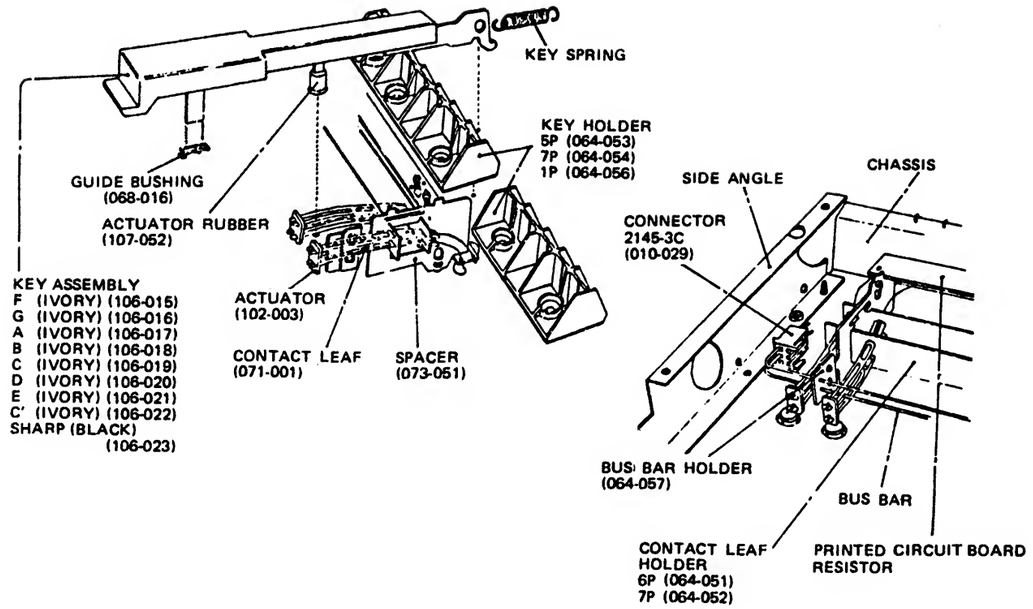




BLOCK DIAGRAM



KEYBOARD PARTS



INSTRUMENT MODEL	NO. OF KEYS	KEYBOARD MODEL	KEY SPRING	BUS BAR	PCB		RESISTOR
					6P	7P	
SH-1	32	SK-132-D	070-052	071H034	052-066	052-067	100 1/4W ±1% CRB1/4FX
SH-3A	44	SK-142-A	070-052	071-008	052-066	052-067	100 1/4W ±1% CRB1/4FX
SH-5	44	SK-142-B	070-052	071-008	052-066	052-067	100 1/4W ±1% CRB1/4FX
SH-7	44	SK-142-C	070-052	071-008	052-066	052-067	100 1/4W ±1% CRB1/4FX
SH-2	37	SK132H	070-052	071-006	052-066	052-067	100 1/4W ±1% CRB1/4FX
SH-1000	37	SK-132-A	070-052	071-006	052-066	052-067	1K 1/4W ±2%
SH-2000	37	SK-132-B	070-052	071-006	052-066	052-067	1K 1/4W ±2% SELECTED
VP-330	49	SK191-B	070-058	071H043	052-081	052-082	
SYSTEM-100	37	SK-132-C	070-052	071-006	052-066	052-067	100 1/4W ±1% CRB1/4FX
SYSTEM-700	61	SK-162-C	070-058	071-007	052-066	052-067	100 1/4W ±1% CRA1/4FX
RS-101	61	SK-161-A	070-058	071-007	052-081	052-082	
RS-202	61	SK-161-A	070-058	071-007	052-081	052-082	
RS-505	49	SK-192-A	070-058	071H043	052-081	052-082	
EP-10	61	SK-162-A	070-058	071-007			
EP-20	61	SK-162-A	070-058	071-007			
EP-30	61	SK-162B	070-058	071-007	052-081	052-082	

PARTS LIST

072H048	Panel H48
068-020	Bushing no.20
061H079	Chassis H79
111-021	Foot G-5 rear
111-023	Foot G-7 front
064H073A	Holder H73A
066H022	Endblock H22 (panel), Bender
066H021	Endblock H21 R/L set
004-013	Keyboard SK132-H
016-057	Knob no.57 rotary
016-033	Knob no.33 slider
063-012	Strip no.12 knob no.33
016-008	Button no.8 grey power switch

Power transformer

022H020C	H20C	100/117V or
022H020J	H20J	100V only
022H020C-B	H20C-B	117V only
022H020D	H20D	220/240V

009-012	Jack SG7622 no.8 PC type
009-036	Jack SG7713 no.8 stereo
008-029	Fuse MGP 0.25A CSA prim. 117V
008-060	Fuse SEMKO T250mA prim. 220/240V
008-059	Fuse SEMKO T200mA sec. 220/240V

SWITCH

001-215	SDG5P001-1 100V
001-216	SDG5P001-2 117V
001-217	SDG5P 502 220/240V
001-234	SRM1034-K15 rotary 3p-4t
001-214	SRM1025-K15 rotary 2p-5t
001-182	SSB022-12PN slide 2p-2t
001-183	SSB023-12PN slide 2p-3t

PCB ASS'Y

149H061A	OPH61A VCO VR board (PCB 052H176A-2)
149H062A	OPH62A VCO (052H176A-1)
149H063A	OPH63A VCF VR board (PCB 052H177A-2)
149H064A	OPH64A VCF (052H177A-1)
149H043B	OPH43B OUTPUT (052H150B)
149H065B	OPH65B Bender (052H140B)
146H031A	PSH31A Power supply 100V (PCB 052H139A)
146H032A	PSH32A Power supply 117V
146H033A	PSH33A Power Supply 220/240V

POTENTIOMETER

Slider

029-306	LFE9RC16A15 100KA
029-317	LFE9RC16B15 100KB
029-319	LFE9RC16B55 500KB
029-308	LFE9RC16A55 500KA
029-309	LFE9RC16A16 1MA
029-575	EVALOPC15B16 100KB 20mm stroke
029-577	EVALOPC15A26 2MA 20mm stroke

Rotary

030-951	EVHLWAD25B15 100KB TUNE
028-749	VM10RK25A15 100KA VOL.

Trimmer

030-641	RJ6 202 2KB metal film
030-642	RJ6 502 5KB metal film
030-643	RJ6 103 10KB metal film
030-465	SR19R 10KB
030-469	SR19R 47KB
030-471	SR19R 100KB

029-022	Bender unit PB-4

SEMICONDUCTOR

IC

020-097	μPC4558C
020-100	TL082CP
020-039	DN819
020-032	μA726HC
020-160	BA662A
non	BA662 Factory selected for VCF. When replacing existing BA662, use one painted in the same color.
020-189	TA7140P
020-102	LF13741H
020-103	TA7179P

Transistor

017-097	2SA826-Q or 2SA733-P
017-118	2SC1740-Q or 2SC945-P
017-046	2SC828 NZ for noise
017-022	2SB434-O or 2SB596-O
017-010	2SD234-O or 2SD526-O
017-014	2SK30A-Y FET
017-016	2SK30A-GR FET

Diode

018-014	1S2473
018-015	SDT-1000 thermistor
018-078	1S2453 or 1SZ58 zener
018-089	1B4B41 stack
019-009	LR0601R LED red

CAPACITOR

Electrolytic

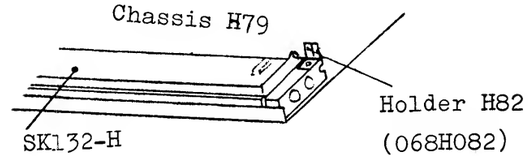
032-275	ECEA25M4R7 4.7 mfd 25V MS-R type
032-190	ECEA 50N1 Bi-polar
032-191	ECEA 16N10 10 mfd 16V B-p.
035-279	ECQS1102K 1000pF 125V polystyren radial leads
035-091	ECQF 2334M 0.33 mfd polypropylene

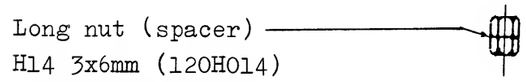
WAFER TERMINAL

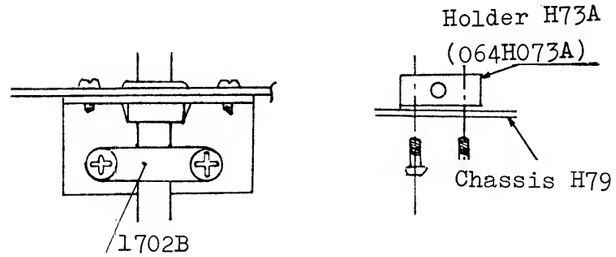
010-183	5045-03A w/friction lock
010-186	5045-05A
010-185	5045-07A

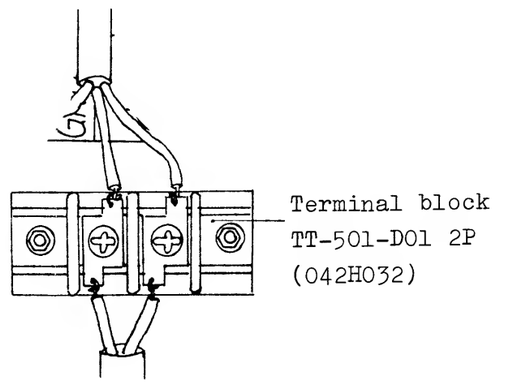
OTHERS

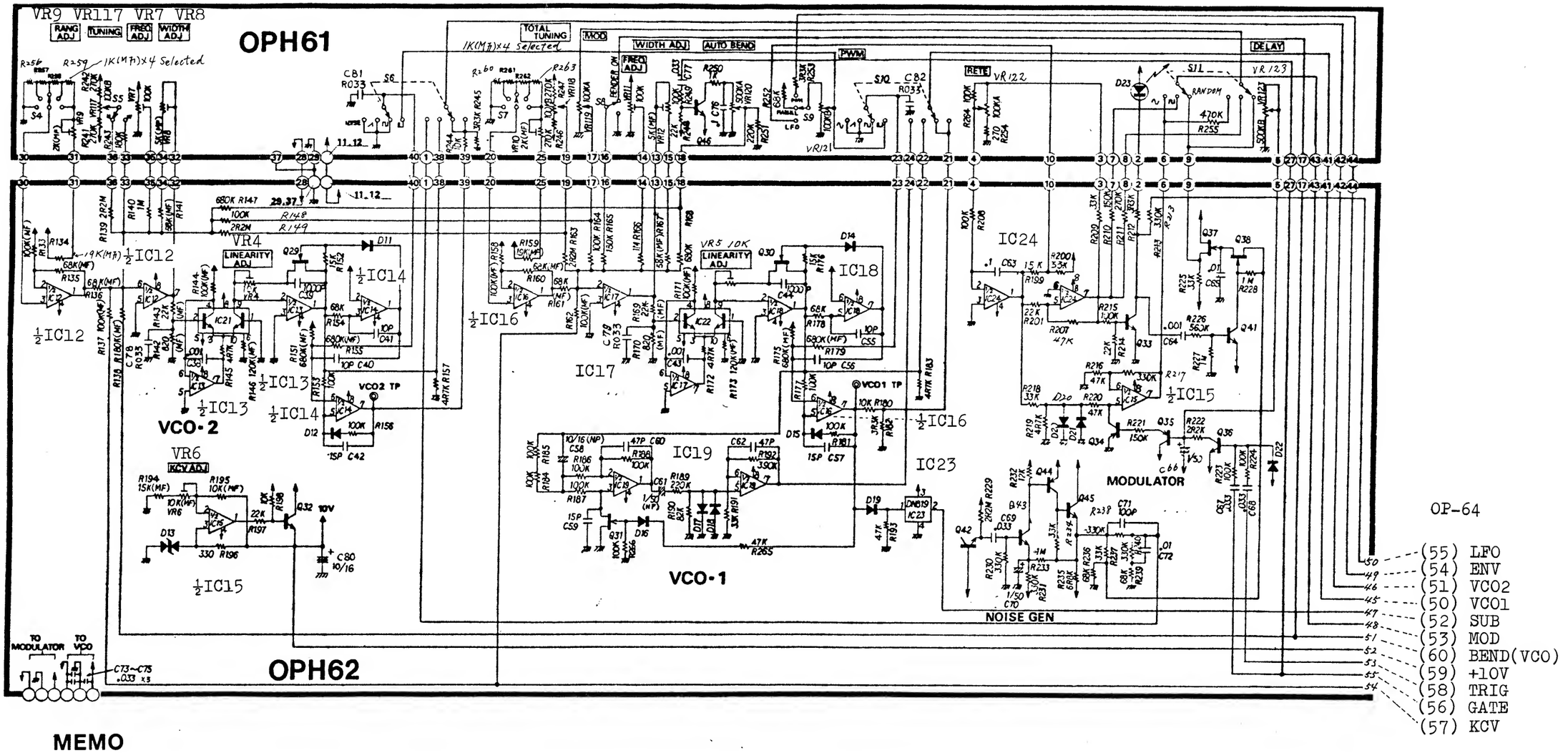
068-005	Bushing no.5 jack black
121-005	Washer no.5 jack
121-018	Washer no.18 jack red
048H001	Heat sink no.H1
012-003	Fuse clip TF758 or F-6
053H031	Flat cable H31





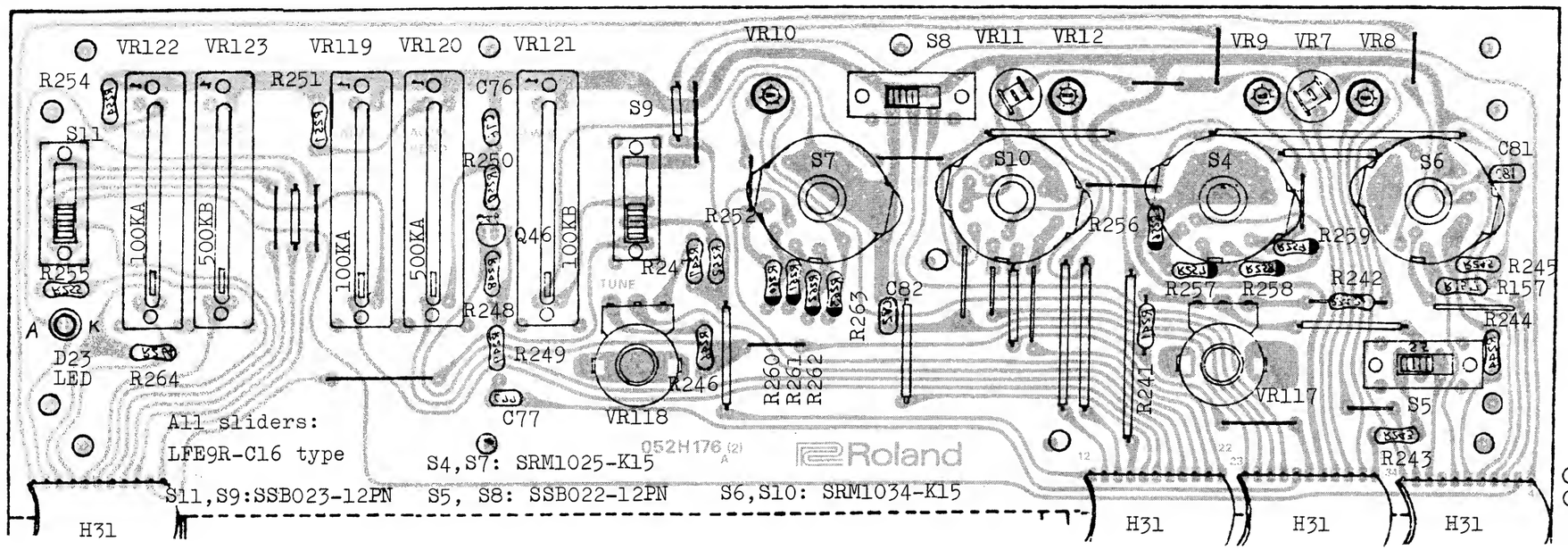





OPH61
VR9 VR117 VR7 VR8
RANG ADJ
TUNING
FREQ ADJ
WIDTH ADJ
TOTAL TUNING
MOD
WIDTH ADJ
AUTO BEND
FREQ ADJ
PWM
DELAY
RETE
RANDOM
VR4
LINEARITY ADJ
VR5 10K
VR6
KCV ADJ
VCO2 TP
VCO1 TP
VCO-2
VCO-1
MODULATOR
NOISE GEN
IC24
IC18
IC17
IC19
IC23
OPH62
TO MODULATOR
TO VCO
C73~C75 .033 x3
(55) LFO
(54) ENV
(51) VCO2
(50) VCO1
(52) SUB
(53) MOD
(60) BEND(VCO)
(59) +10V
(58) TRIG
(56) GATE
(57) KCV

OP-64

MEMO



2SK30A- GR or Y
2SA826Q or 2SA733P
2SC1740Q or 2SC945P
1S2473 or 1S1555

SR19R

RJ6 Metal film

R-25J Carbon
CRB1/4FX Metal oxide film

R260-R263 *
R257-R259 **

Each group of four is factory selected as neary as possible for the same value.

LED LR0601R

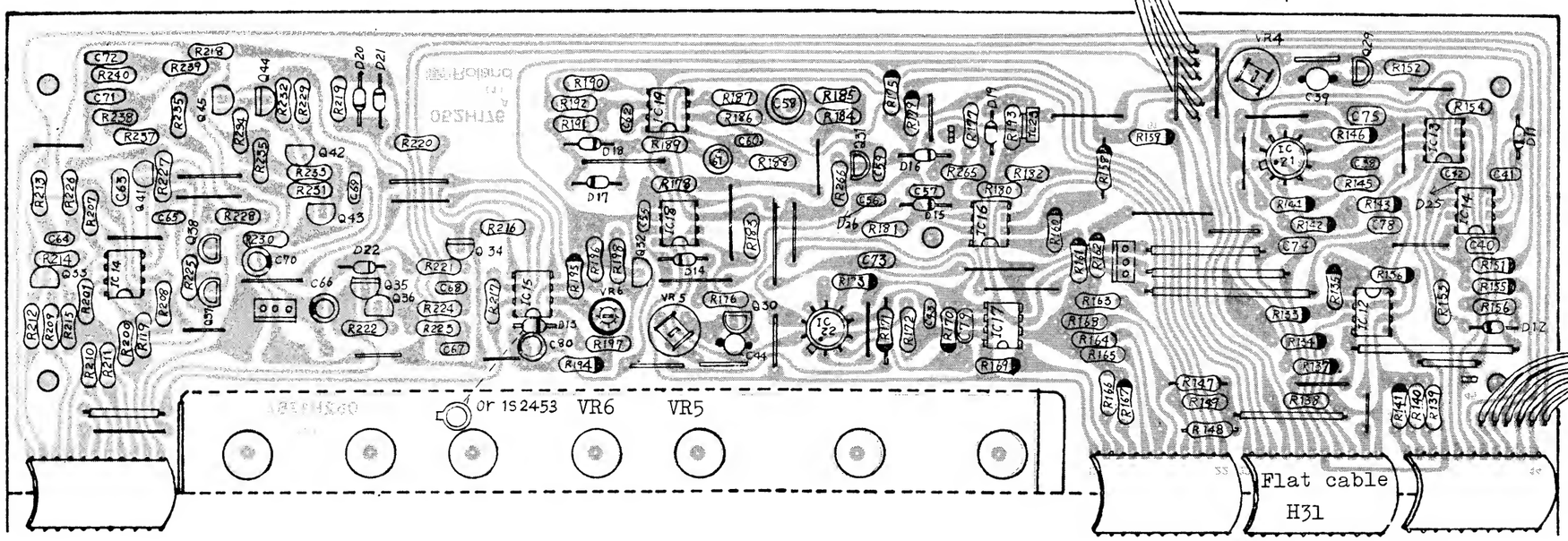
Holder H77

OPH61A 149H061A View from the foil side

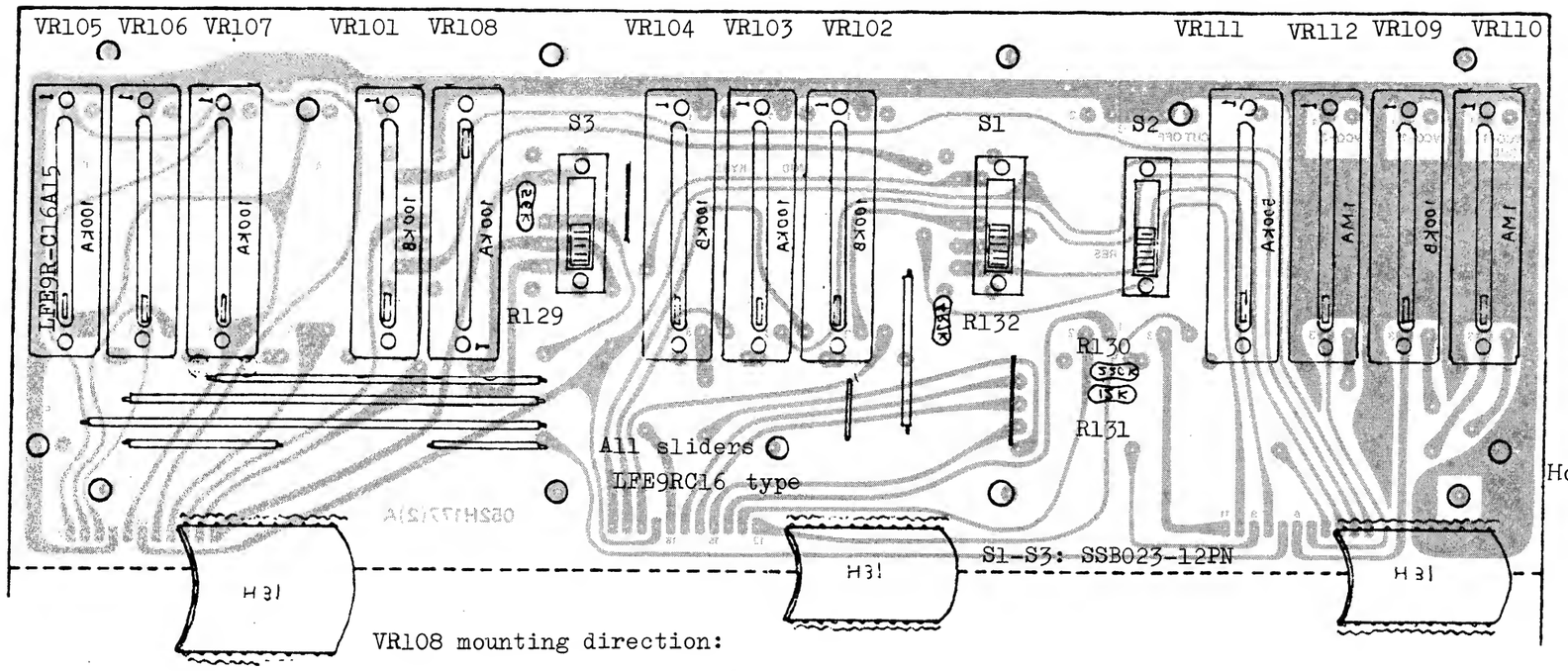
VR117: EVHLWAD25B15 100KB
VR118

EMCB0512A51
(010-229)

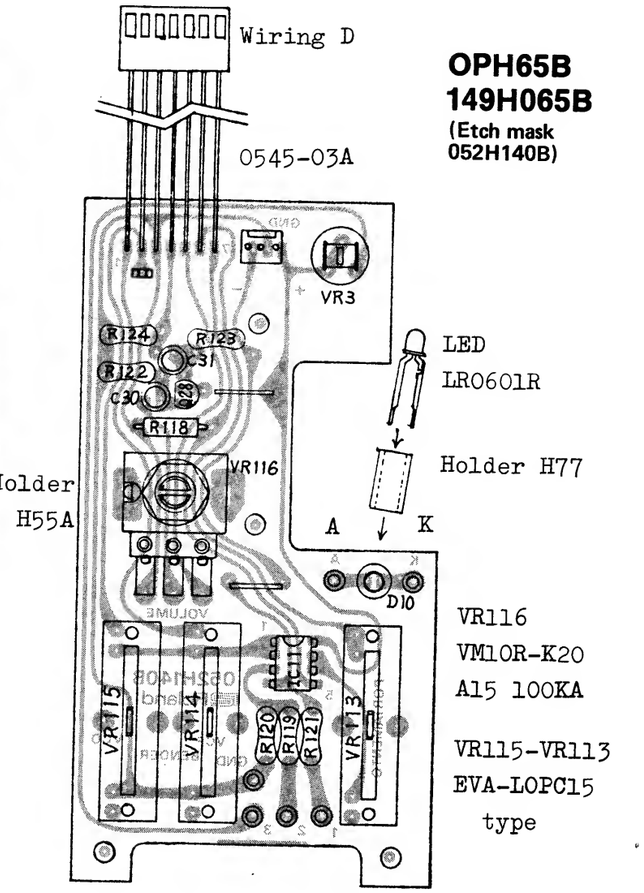
OPH62A 149H062A (Etch mask 052H176A-1)



EMCB0610A51
(010-230)



OPH63A 149H063A View from the foil side



OPH65B
149H065B
(Etch mask 052H140B)

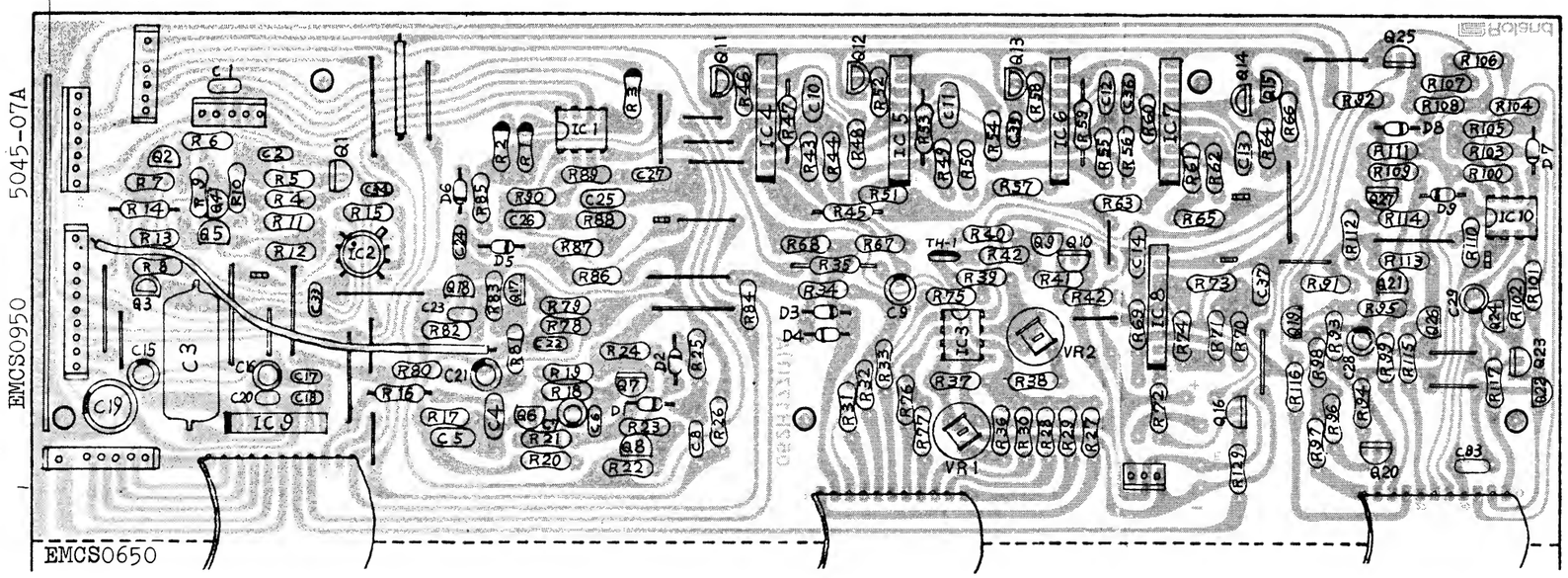
VR116
VM10R-K20
A15 100KA

VR115-VR113
EVA-L0PC15
type

Shield H58

OPH64A 149H064A (Etch mask 052H177A-1)

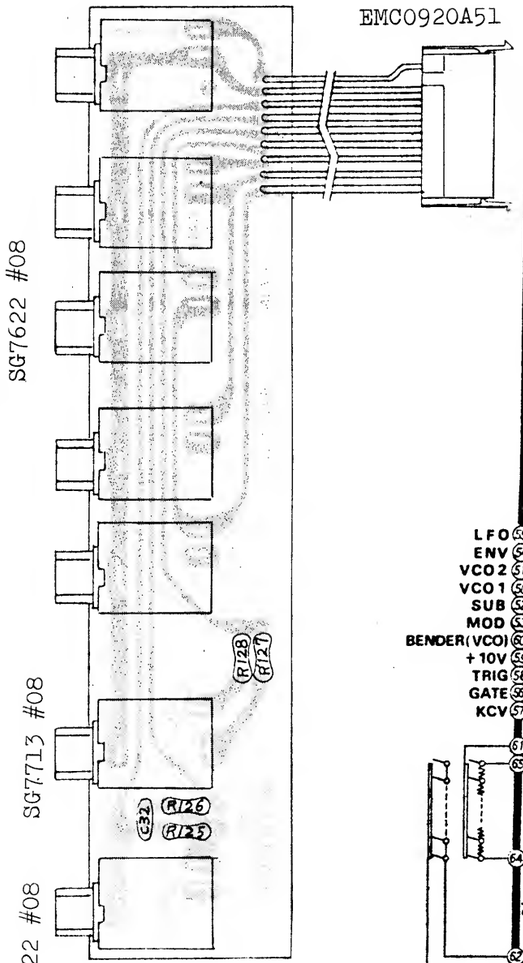
EMCS0550 5045-05A

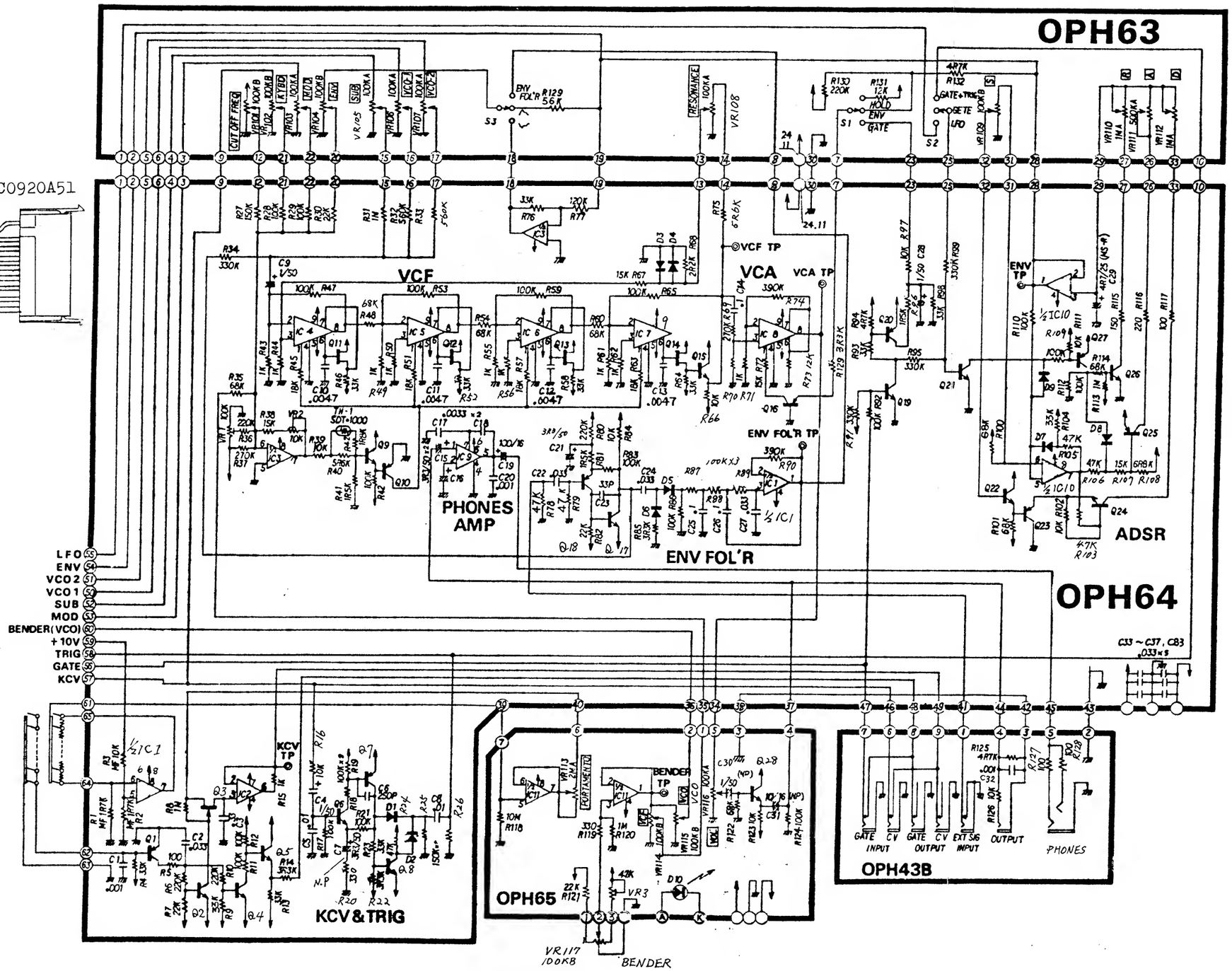


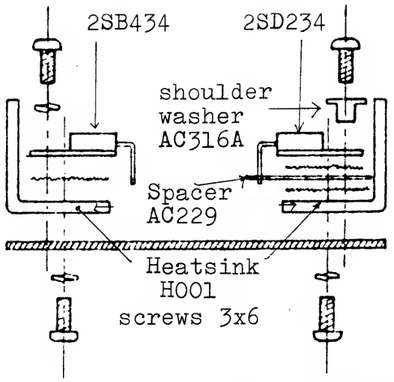
- 2SK30A GR or Y
- 2SA826-Q or 2SA733-P
- 2SC1740-Q or 2SC945-P
- 1S2473 or 1S1555
- R-25J Carbon resistor
- Metal oxide film resistor CRB‡FX
- SR19R

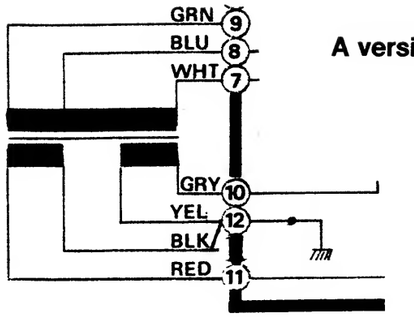
IC8 ------ BA662A
IC4-IC7 -- BA662 factory selected
When replacing IC4-7, use BA662 of the same color.

OPH43B 149H043B
(Etch mask 052H150B)



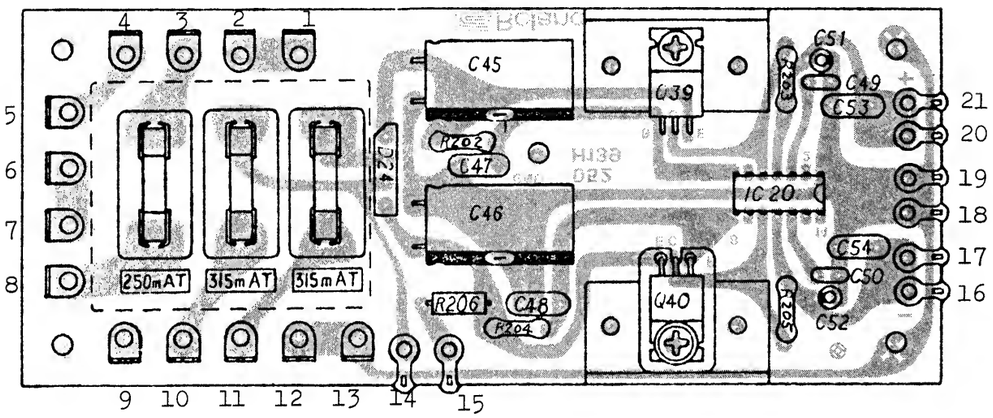


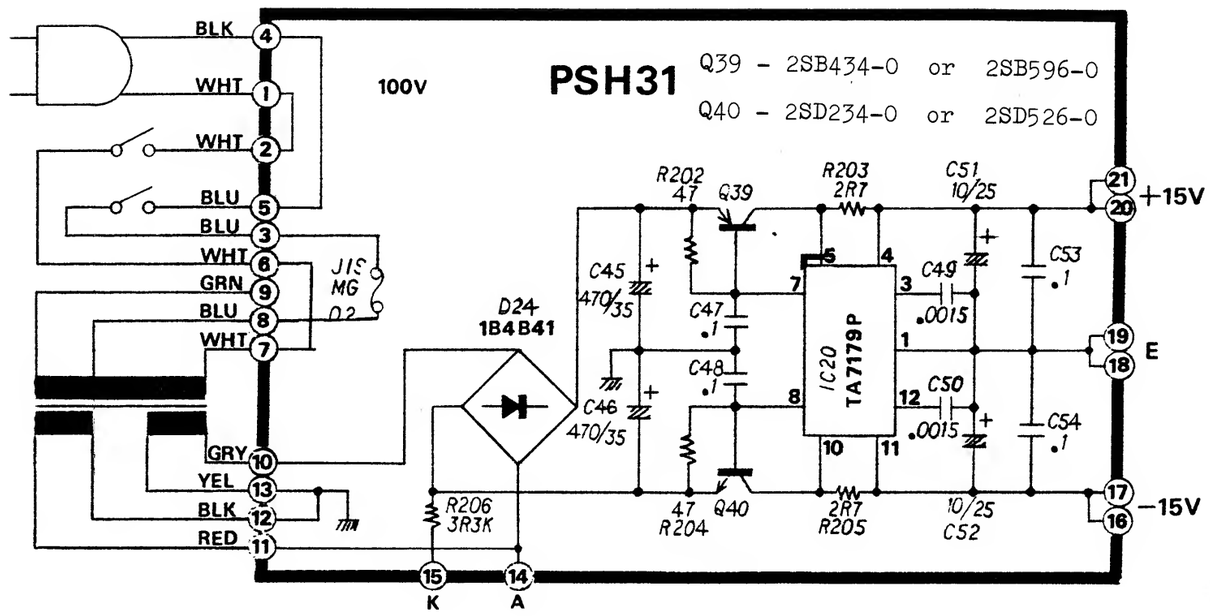




A version

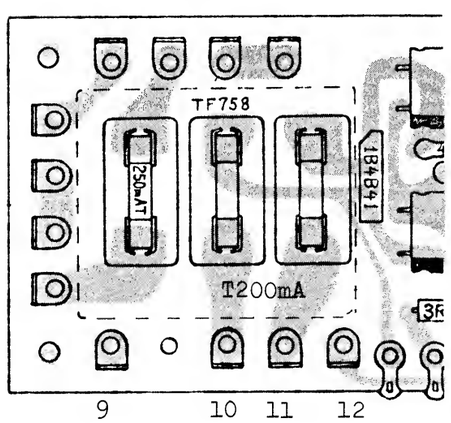
PSH-31/32/33 (for replacement, use A version)

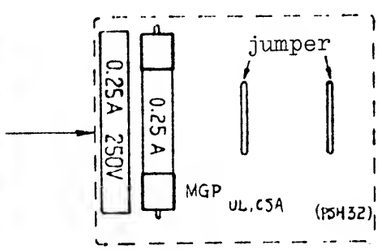




117V **PSH32A** 220/240V **PSH33A**

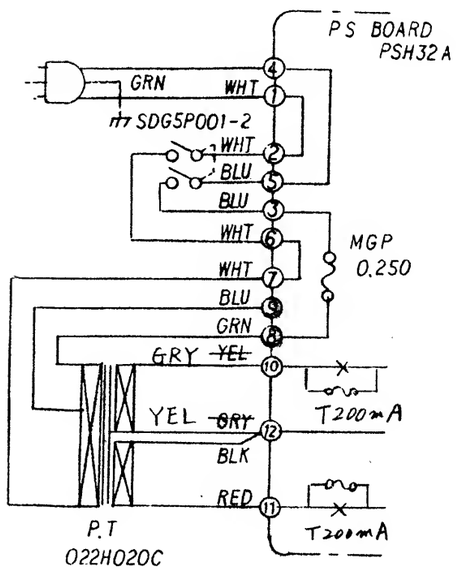
PSH31A 100V, PSH32A 117V, PSH33A 220/240V
146H-31/32/33-A (Etch mask 052H139A)
Serial No. 830600 and higher

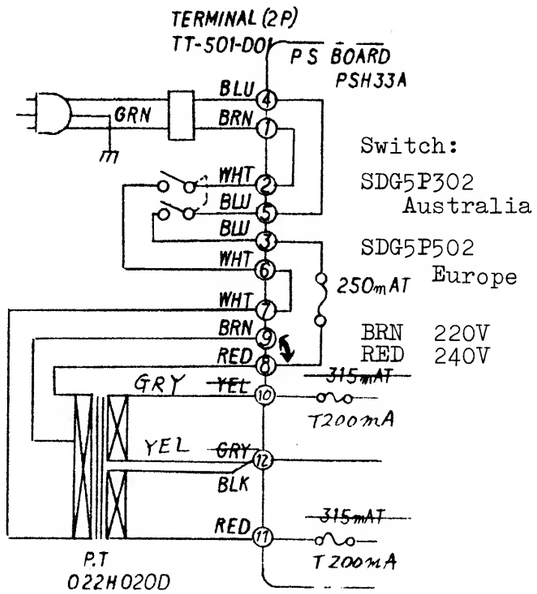




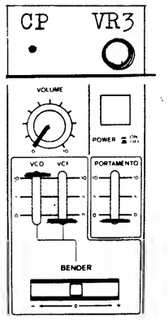
PSH32

Terminals, nos.10-12 are different from preceder in location.
The rest remains unchanged.





ADJUSTMENT



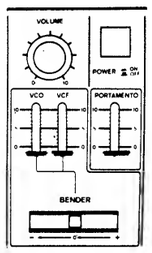
BENDER

Connect a digital voltmeter to the TP on OPH65 shown in the figure left.

1. While pushing BENDER lever to the extreme left, note the reading on the meter.
2. While holding the lever at the extreme right, adjust VR3 for the reading equal to that of step 1.

Permissive voltage difference between the readings is ±30mV.

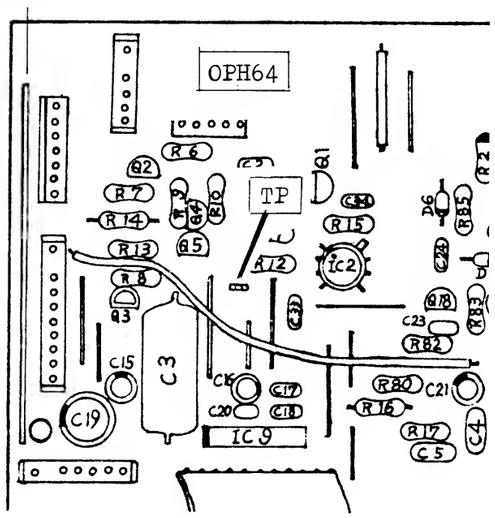
KCV

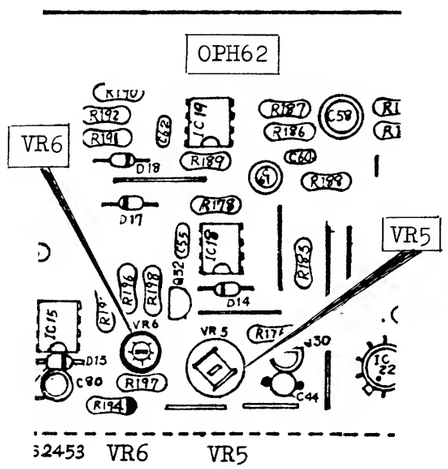


Shift the meter to the TP on OPH64 shown below.

1. While depressing F1 key, read the value of KCV on the meter. (For key designation, refer to page 1.)
2. While depressing F4 key, adjust VR6 for the reading 3V higher than that of step 1.

Make sure that F1, F2, F3 and F4 deliver 1V/1 oct voltages. Also voltage differences between every couple of octave keys must be within the range of 1V ±2mV.

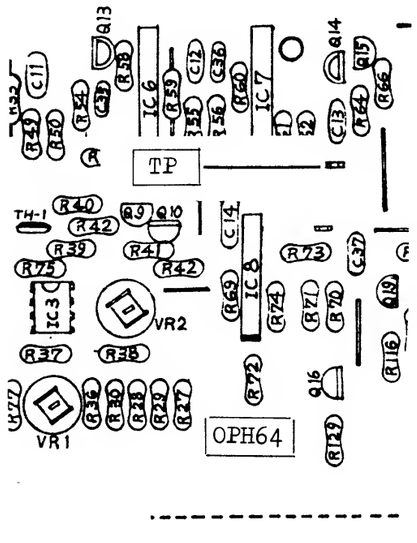




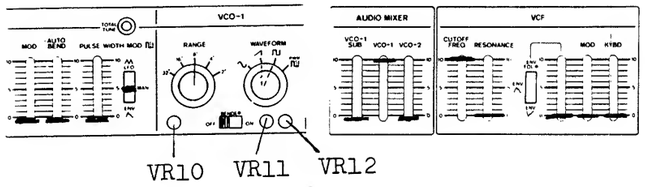
32453 VR6 VR5

VCO-1

For the following tuning, use a completely tuned electronic instrument or a Tuning Meter. Adjustment can be made either beat sound method or by displaying Lisajous on an oscilloscope screen with a reference pitch being applied to EXT TRIG of the scope, For the latter, connect scope V IN to the TP on OPH64 shown in figure right.



WIDTH



Coarse

1. While holding down F1 key, adjust VR11 (FREQ) for the pitch.
2. Tune other F's in the order F2, F3 and F4 by turning VR11 with corresponding key being held down.

Fine

1. With F1 key held down, turn VR12 (WIDTH) in the direction causing F1 further out of tuned, (do not attempt tuning F1 to the correct pitch at this step). Reverse rotation degree of VR12 should be proportional to F1 deviation from the reference pitch.
2. With F4 key down, tune F4 to the pitch with VR11.
3. Repeat steps 1 and 2 until all F's are correctly tuned. TOTAL TUNE knob can be the substitution for VR11.

IMPORTANT: Do not turn VR12 during subsequent adjustments.Turning VR12 will invalidate the entire VCO-1 adjustments.

LINEARITY

Set VCO-1 RANGE at 2'.

1. While depressing F1 key, tune F1 to pitch with TOTAL TUNE.
2. While depressing F3 key, adjust VR5 on OPH62 for the pitch.
3. Check all F keys for out of tune, if there any, repeat steps 2 and 3.

RANGE WIDTH

Set VCO-1 RANGE at 32'.
1. While holding down F1 key, adjust F1 for the pitch with TOTAL TUNE.
2. Place the RANGE at 2' and tune F1 to the pitch with VR10 (RANGE WIDTH).

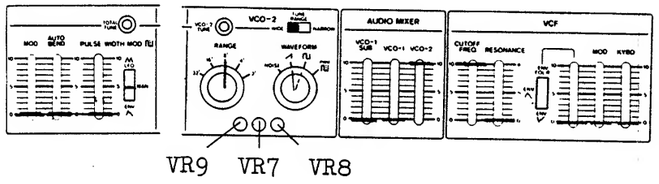
FREQUENCY

Set VCO-1 RANGE at 8' and TOTAL TUNE at center of its travel range.
1. While depressing F1 key, adjust VR11 for F1 in tune.

VCO-2

WIDTH (Being analogous to VCO-1 WIDTH Adjustment, reffer to it for the detail.)

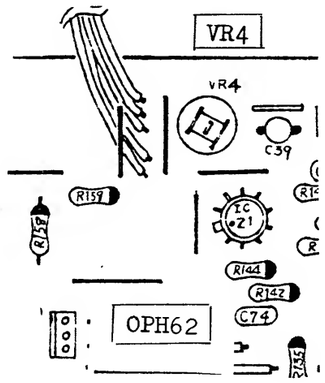
Coarse
1. With F1 key held down, adjust VR7 (FREQ) for pitch.
2. Tune F2,F3,F4 in sequence with VR7.



Fine
1. With F1 key down, turn VR8 (WIDTH) to cause F1 further out of tuned.
2. With F4 key down, tune F4 to the pitch with VR7. (VCO-2 TUNE, VR117 may be used instead of VR7.)
3. Repeat steps 1 and 2.

Do not turn VR8 after WIDTH adj. Inadvertent turn of VR8 at the last minute of the VCO-2 adjustments will reduce VCO-2 circuit to non-adjusted condition.

LINEARITY



Reset VCO-2 RANGE at 2'.
1. While depressing F1 key, tune F1 to the pitch with VCO-2 TUNE.

Set VCO-1 RANGE at 2' and raise VCO-1 knob on the panel (AUDIO MIXER) for a proper beat note volume.
2. While listening to the VCO -1 -2 beat sound, adjust VR4 (LINEARITY) on OPH62 for minimum beat repetition at F3 and F4 keys.(repeat steps 1 and 2)

RANGE WIDTH

Reset VCO-2 RANGE at 32'. (AUDIO MIXER VCO-1 knob: at bottom)
1. Tune F1 to the pitch with VCO-2 TUNE knob.

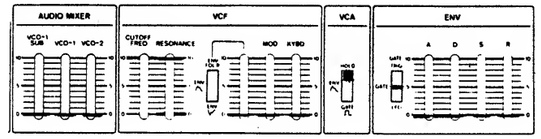
Reset VCO-2 RANGE at 2'. Slide up VCO-1 knob for a beat note.
2. While holding down F1 key, adjust VR9 (RANGE WIDTH) for minimum beat repetition.
3. Repeat steps 2 and 3.

FREQUENCY

1. While switching TUNE RANGE on the panel -WIDE-NARROW-WIDE---- repeatedly, set VCO-2 TUNE at the point assuring the least pitch difference between the switch positions.
2. While depressing a key with TUNE RANGE set at NARROW, adjust VR7 to tune the note to the pitch.

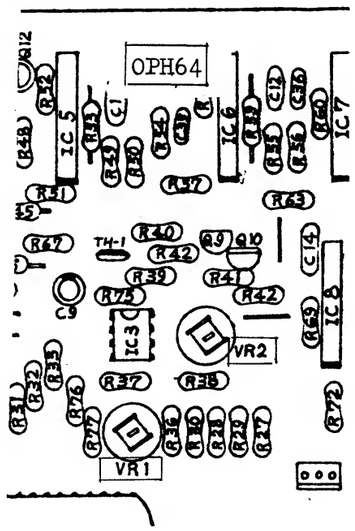
VCF

Make sure that VCF starts and sustains oscillation at 7-9 RESONANCE scale.



WIDTH

1. While depressing A2 key, tune the note to approx. 1kHz with CUTOFF FREQ knob. (T=1ms)
2. Adjust VR2 (WIDTH) on OPH64 so that C1 and C2 keys develope VCF-generated notes having one octave relation with each other.



FREQUENCY

Slide up CUTOFF knob to the top.
1. while holding down F1 key, adjust VR1 for 20kHz.

Make it certain that low end key provides note less than 50Hz. Typically it is on 50Hz when C2 key is played with CUTOFF set at 0 (zero).